Ivan P. Pavlov's View on Vivisection

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Abstract—Pavlov's points of view on vivisection are analyzed and compared with the modern ethical conception of carrying out experiments on animals. It appears that Pavlov's points of view are largely in accordance with modern ethical requirements for experimenting on animals.

THE 150TH ANNIVERSARY of Ivan P. Pavlov's birthday was widely celebrated in 1999. A great number of papers were devoted to his scientific activity, but Pavlov's opinions on ethics in animal experiments were not discussed. The aim of this paper is to give an analysis of Pavlov's views on animal experiments in comparison to modern ethical conceptions for conducting animal experiments.

In his experiments on animals, Ivan P. Pavlov did not ignore bioethical problems. In his article "Vivisection," published in *The Real Encyclopedia of Medical Sciences* in 1893, modern aspects of animal experimentation, find their expression: "It will be correct to widen the meaning of the concept 'vivisection' to the notion of experimenting on a living animal in general, even in cases when the experiment does not demand an operation" (Pavlov, 1893).

One of the most important bioethical principles for conducting animal experiments is minimizing pain, discomfort and distress of animals during and after the experiment (Russell, and Burch, 1959; Flecknell, 1994; Anon 1994b). Pavlov paid special attention to the use of anaesthesia and other methods of sedation, with the aim of allaying or minimizing animals' pain during the experiment. Pavlov achieved this aim by using analgetics and anaesthetics and by improving experimental procedures. Pavlov wrote, "Wherever it is possible it is necessary without damaging the experiment to allay or completely prevent animal sufferings by applying chloroform, ether, opium, morphine, chloral hydrate, cocaine, alkaloids etc." (Pavlov, 1904). But Pavlov also insisted that the exercise of allaying and other considerations should not contradict the aim of the experiment (Pavlov, 1893).

Present-day research on animals is usually conducted in conformity with some sort of national legislation (Hampson, 1990; Hamm et al., 1995; Towsend and Morton, 1995; Kopaladze, 1998), such as from the Recomendations of the Council of Europe Convention for the Protection of Vertebrate Animals Used for Experimental and Other Scientific Purposes (Anon, 1986a) and the Directive 86/609/EEC (Anon, 1986b). Essential work on the humanization of animal experimentation is being conducted by the Council for International Organizations of Medical Sciences (CIOMS) as well as by Federation of European

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Laboratory Animal Science Associations (FELASA) and European Centre for the Validation of Alternative Methods (ECVAM). These organizations suggest that medical and biological research and safety evaluation of pharmacological preparations are still in need of animal experimentation. And yet humane attitude toward laboratory animals requires avoidance of pain and distress, widespread use of anaesthesia, and analgesia, and use of living animals in experiments only in those cases when there is no alternative (Anon 1985; Anon 1994b; Anon 1999).

Another important aspect of the humanisation of animal experiments is the decrease in the number of animals used, which demands the correct planning of the experiment itself and enhancing the quality of animals under the experiments (Russell, and Burch, 1959; Festing,1994). Pavlov considered that while conducting physiological investigations the researcher should not limit oneself to merely a few experiments when a larger number would be required to achieve reliable results. Pavlov emphasized that the results of experiments should be irreproachable, reproducible and verified.

Admitting the fact that physiological experiments demanded a sufficient number of animals, Pavlov was sharply opposed to wastefulness. He requested scientists to control animal well-being, and did not allow using a number of animals in excess of what was required. He wrote, "For 10 years almost the entire medicine has been passionately straining to study microorganisms as causes of various pathological processes. But experimentators stay alien to this tendency and continue carrying out their chronic experiments in most cases without taking any appropriate measures of protection of animals as far as microorganisms are concerned." And he asked, "What's the efficacy of this useless waste of animals, labour, and time?" (Pavlov, 1893).

Pavlov also emphasized that, "in using animals it is necessary to take into consideration not only the species of the animal but also other aspects, such as its age, the season of the year, the animal being hungry or well fed, pregnant, and so on" (Pavlov, 1893). In Pavlov's time there existed no rules to govern laboratory animal science. To day's standards for animal experimental results are determined by the animal's micribiological status, its health condition, genetic status, its feeding and management (Anon, 1986a; Festing, 1993,1994; Flecknel,1994; Anon,1994a).

Pavlov paid great attention to the correct choice of the species of experimental animals, taking into account their anatomic, physiological, and psychological attributes. Special attention was also paid to choice of animals in pharmacological tests. Pavlov believed that "in pharmacology, the study of relations between a living body and a chemical agent should not be limited to one animal species, but each substance should be investigated in several species of animals" (Pavlov, 1893).

It is well known that Pavlov was especially accurate in collecting and accumulating factual data. He was most punctual in his claims of this kind regarding both his own and his staff's work (Orbeli, 1949). He wrote, "It is necessary to notice carefully and regulary the slightest circumstances of the experiment. Some strange and purely external condition may happen to be decisive for the principal result of the experiment" (Pavlov, 1893). Thus, it is quite clear that the famous physiologist always paid special attention to factual data. The findings were for him more important than theoretical ideas. In all cases, when convinced of the accuracy of the received data, Pavlov's method required that he justify his hypotheses or reject his hypotheses when evidence contradicted them. Pavlov's saying, "Facts are the breath of life for a scientist," is well known (Pavlov, 1936). Academician Orbeli (Pavlov's disciple) recollected, "After Ivan Petrovich's 55–year investigative activity we do not know a single fact which could be disproved. Ivan Petrovch sometimes had to refuse his own theoretical conceptions, he changed them, he turned them over, he replaced them by new ones but he never needed to refuse any facts, because the facts in his investigations were irreproachable" (Orbeli, 1949).

In present-day research great attention is paid to the use of alternative methods for research as opposed to using animals. When possible, living animals are replaced by non-sentient material such as tissue cultures and computer models; mammals are replaced by animals with less well-developed nervous systems; whole animals by decerebrate ones, or by isolated organ systems (Russell, and Burch, 1959; Balls, 1994; Anon 1999).

In Pavlov's time, people did not think of introducing alternative (replacing living animals) methods of investigation. Still it is necessary to point out that Pavlov developed an analytical method in experiments, which had much in common with present-day alternative methods. He wrote, "The highest form of the analytic tendency to study each organ uninfluenced by other organs is the method of extracting it completely from the body and creating for it conditions furthering its existence" (Pavlov, 1893). But Pavlov was interested in alternative methods not only from the scientific point of view but also from the point of view of ethics. He wrote, "So far as agonizing experiments are concerned it is important to take all necessary measures to minimize as much as possible this dark side of experiments which is painful to watch for the experimentators themselves. Wherever it is possible it is necessary to take frogs, mice, rats etc. instead of dogs, cats etc." (Pavlov, 1904).

Conducting animal experiments in the most humane way possible requires high qualifications, good theoretical background, and sufficient practical experience of experimentators (van Zutphen, and van der Valk, 1995; Anon 1995; Anon 1999). Pavlov paid special attention to the appropriate training of young specialists. He suggested in particular that experienced colleagues keep control over young vivisectionists, and pass their experience to them. He assumed that beginners would be admitted to vivisection and traumatic operations only after acquiring appropriate mastery of experimental methods and techniques, methods of general and local anaesthesia and, what is especially important, an experimental mentality and skill of analysing facts. Addressing the young researchers, Pavlov wrote, "Don't turn yourselves into archivists of facts. Try to penetrate into the secrets of their origin. Be persistent in looking for the laws that rule facts" (Pavlov, 1936).

Pavlov was against scientists being checked by nonspecialists but he recommended qualified control. It is interesting to note in this respect the following fact. In 1903 baroness Meiendorf, the head of the Central Board of the Russian Society for Animal Protection, applied to the War Minister for support in a letter entitled "On vivisection as a disgusting and useless abuse on the score of science." The War Minister asked the Academy of Sciences to give their opinion on the baroness's letter. On January 17, 1904 the commission gave its inference, expressing disagreement with the letter. Pavlov wrote: "When I begin an experiment entangled with the final death of the animal I suffer a great feeling of regret at interrupting a triumphant life, being a butcher of a living being. But I suffer this for the sake of the Truth, for man's benefit, and those non-professionals want to put me and my vivisection activity under somebody's control." The Commission's resolution on vivisection and Pavlov's special opinion were published in 1904 in the magazine, 'Proceedings of Imperial Military Medical Academy[a] (Pavlov, 1904).

Even so, Pavlov never comforted himself with the idea that his painful experiments pursued a noble aim. Pavlov defended vivisection, but he never justified painful experiments by their noble cause. "If mankind has still been tolerating the sport of hunting animals, that is, their sufferings and deaths for the sake of people's amusement, if there still exists slaughter of animals for feeding people, if thousands of people are constrained to suffering and death during wars; why should we defy using animals for the sake of one of man's highest aspirations, that of knowledge and science, one of the great ideas, the idea of the Truth!" (Pavlov, 1893). However, the famous physiologist also wrote the following, "It is necessary to admit with bitter regret that the dog, man's best pet, on account of its high mental and moral development is the most frequent victim of biological experiments. In prolonged experiments the operated animal after recovery from the operation, serves as an object of long-lasting observations and becomes, in a way, a participant of your experiment on it. By its eagerness and willingness the dog assists the success of your experiment. Only a cruel man could use such an animal in another experiment connected with its sufferings and death" (Pavlov,1893). This conviction, formulated in the end of the 19–th century, seems to be absolutely correct nowadays. In 1935, following Pavlov's initiative, a monument to the dog was erected near the Institute of Experimental Medicine in Leningrad (St. Peterburg) in gratitude for its participation in experiments.

Pavlov was criticized by animal defenders beyond Russian borders as well. On July 24, 1927, Herbert Wells, published an article in *New York Times* entitled "Ivan Pavlov and Bernard Shaw", in which he gave a rebuff to the famous playwright who had criticized vivisectors. The playwright wrote, "If for scientific discoveries it is important to conduct experiments on animals, it is better to refuse the discoveries". Defending scientists' rights to conduct physiological experiments, Wells had analyzed Pavlov's and Shaw's contribution to world history and wrote, "Pavlov is a star, which is shining to the world, brightening up distances unknown until now" (Wells,1927). This article caused a storm of protests from opponents of vivisection. In a letter to the editorial board Diana Bellet, the President of New York Society of Animal Protection, objected to Wells's point of view. Bernard Shaw published his reply, "I have never condemned Pavlov's experiments on animals, but I really reget that I cannot offer myself instead of a dog for experiments" (Samoilov, and Moszhukhin, 1989).

It is clear to see how easy it is to be a humanist and preach morals, but it is much more difficult to be an experimentator and a moralist at the same time. Basing his arguments on the necessity of conducting experiments on animals, Pavlov emphasized that animals should not suffer because of irresponsible and unqualified experimentators. "Let the dog", Pavlov wrote, "man's assistant and friend from the prehistoric times, be given as a victim to science, but our dignity obliges us to perform these experiments without any unnecessary pain" (Pavlov,1893).

The ethical problem is that it is difficult to consider humane the use of living animals for medical and biological experiments (Haward-Jones, 1985). But we must distinguish inhumanity causing pain and suffering to an animal that is constrained by the experiment itself (direct inhumanity) or by unqualified and irresponsible attitude to the animal under experiment (contigent inhumanity)(Russell, and Burch, 1959). Modern international requirements set forth that laboratory animals are protected during experiments so that "unnecessary torture", as Pavlov would say, would be avoided.

One of the main ethical principles appears to be the scientific and practical significance of experiments. It is important to note that Pavlov was awarded the Nobel Prize in 1904 for his studies in the field of physiology of digestion. But his creative activity was crowned by his discoveries of conditioned reflexes. Pavlov contributed greatly to the development of experimental biology and experimental medicine. Since 1927 his papers have been translated into many different foreign languages. In 1927 his work, "Conditioned Reflexes", was translated into English and edited by Dr. G.V. Anrep in New York. In 1928 his work

"25 years of objective study of the higher nervous activity (behaviour of animals)" was translated into English by Dr. W.H. Gantt in New York. By his scientific achievements Pavlov confirmed one of the main ethical principles of experimentation: awareness of high scientific regard and practical significance of the research provided.

Upon analysis of Pavlov's views and his practical actions, the following ethical principles may be formulated. They can be traced in his papers, and their importance can hardly be overestimated today:

1) use of living animals in research is recommended only when the scientific and practical significance of the investigations conducted is well-grounded;
2) discomfort, distress, and pain of animals under experiment should be minimized as much as possible, without reducing the quality of research;
3) experimental procedures, methods of anaesthesia, analgesia, and sedation should be continuously improved;
4) only animals of proper quality and in appropriate numbers, should be used in experiments for getting reliable results;
5) use of excess number of animals is inadmissible;
6) animals for the experiment should be chosen in accordance with their anatomic, physiological, and psychological state and qualities;
7) when possible, dogs and cats should be replaced by animals with less well-developed nervous systems;
8) steady observation and careful protocols of experimental procedures and their results should be sustained;
9) theoretical and practical qualifications of experimenters on animals should be constantly improved;
10) there should be strict control over new experimenters.

Thus, we see that Pavlov's views were well ahead of his time and are in compliance with modern ethics of experiments on living animals.

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